

Background of the Invention

Cross-Reference to Related Applications

This application claims the benefit of and incorporates by reference prior filed copending U.S. Provisional Application Serial No. 60/428,679, filed November 25, 2002.

Summary of the Invention

This invention secures dead bolt locks in a fixed or adjustable slot embodiment and is capable of fitting on a dead bolt disposed in any angular position on a door having a door knob, to secure the dead bolt against rotation to the unlocked position. In a preferred adjustable embodiment the dead bolt lock is characterized by a circular housing having downwardly-extending, spaced-apart, parallel legs and an open, round center, with front, middle, (or middle and backing) and rear plates attached to each other and rotatable on and in the housing and having matching facing slots or openings to accommodate the dead bolt when the adjustable dead bolt lock is positioned on the dead bolt and the legs extend downwardly between the door knob and the door. In the adjustable design, a spring-loaded retainer block is situated in a receiving profile slot in at least the middle plate in communication with the matching front plate dead bolt slot and the corresponding rear plate slot, for selective recession in the receiving middle plate profile slot and extension into the registering rear plate slot, to facilitate exerting a stabilizing force on the dead bolt when the dead bolt lock is located in functional configuration on the dead bolt. In an alternative embodiment a backing plate may include a backing plate slot and a sliding keeper and may be glued or otherwise fixed to the middle plate for rotation with the middle plate in the round center of the housing. Furthermore, notches are provided, typically 180-degrees around the curved top portion of the slot housing rim, to facilitate selectively inserting a spring-loaded notch leg in one of the notches responsive to manipulation of the

spring-loaded keeper. Rotation of the connected front, middle and rear plates, as well as the backing plate, is facilitated in concert with respect to the housing and corresponding rotational adjustment of the front plate dead bolt slot, the middle plate profile slot, the backing plate slot and the rear plate slot together accommodates a dead bolt in any angular locked configuration on a door.

In fixed slot embodiments of the dead bolt lock of this invention the housing contains no adjustment feature, but instead, has an X-slot or a cross-slot, or a single vertical or horizontal slot for accommodating a dead bolt under circumstances where limited angular accommodation of the dead bolt is required. In the cross-slot embodiment a sliding plate may be provided on the dead bolt lock housing for engaging the dead bolt when the dead bolt lock is in functional configuration on the dead bolt.

The invention will be better understood by reference to the accompanying drawings, wherein:

FIGURE 1 is a perspective view of a preferred adjustable embodiment of the dead bolt lock of this invention in functional configuration on a dead bolt in locked configuration on a door, with the downwardly-extending, parallel legs positioned behind and on each side of the underlying door knob;

FIGURE 2 is a perspective view of the adjustable dead bolt lock spaced from the dead bolt and door knob illustrated in FIGURE 1, more particularly illustrating positioning of the adjustable dead bolt lock on the dead bolt and door knob;

FIGURE 3 is an enlarged perspective view of the adjustable dead bolt lock illustrated in FIGURE 1, more particularly illustrating recession of the retainer block in the corresponding retainer block slot against spring tension in the middle plate to accommodate a locked dead bolt,

illustrated in phantom;

FIGURE 4 is a sectional view taken along line 4-4 of the adjustable dead bolt lock illustrated in FIGURE 3, more particularly illustrating preferred internal components of the adjustable dead bolt lock. These components include the retainer block, retainer block springs and the slotted plates attached to the retainer block, as well a notch retainer and retainer spring controlling the bias of the notch retainer and an associated keeper and keeper spring, all associated with the middle plate. The notch retainer is illustrated in unlocked configuration with respect to the slots provided in the rim of the lock housing by operation of the spring-loaded keeper;

FIGURE 5 is a sectional view of the adjustable dead bolt lock illustrated in FIGURE 4, more particularly illustrating removal of the keeper against spring-bias from contact with the notch retainer to facilitate bias of the notch leg element of the notch retainer by spring tension into the closed configuration in one of the slots provided in the rim of the lock housing. This configuration prevents rotation of the front, middle and back plates in concert with respect to the housing and allows the dead bolt lock to accommodate a dead bolt (not illustrated) in a particular angular locked configuration on a door;

FIGURE 6 is an exploded view of an embodiment which includes front plate, middle plate and lock housing elements of the adjustable dead bolt lock illustrated in FIGURES 1-5, more particularly illustrating the front plate and middle plate removed from the lock housing;

FIGURE 7 is an exploded view of the rear plate and lock housing elements of the adjustable dead bolt lock illustrated in FIGURE 6, more particularly illustrating the housing and removed rear plate combination;

FIGURE 8 is a perspective view of a non-adjustable X-slot embodiment of the dead bolt

lock of this invention;

FIGURE 9 is a perspective view of a non-adjustable cross-slot dead bolt lock of this invention.

FIGURE 10 is a front perspective view of the non-adjustable cross-slot dead bolt lock illustrated in FIGURE 9, incorporating a sliding retainer plate oriented in dead bolt-disengaged configuration;

FIGURE 11 is a rear perspective view of the non-adjustable cross-slot dead bolt lock with sliding retainer plate illustrated in FIGURE 10;

FIGURE 12 is a rear perspective view of the non-adjustable cross-slot dead bolt lock illustrated in FIGURE 11, with the retainer plate engaging the dead bolt in functional configuration;

FIGURE 13 is a perspective view of a non-adjustable vertical slot embodiment of the dead bolt lock of this invention; and

FIGURE 14 is a perspective view of a non-adjustable horizontal slot embodiment of the dead bolt lock of this invention.

Description of the Preferred Embodiments

Referring initially to FIGURES 1, 2, 6 and 7 of the drawings in a preferred embodiment the adjustable dead bolt lock of this invention is generally illustrated by reference numeral 1. The adjustable dead bolt lock 1 is characterized by a lock housing 2, typically having a circular housing rim 3 with a round housing opening 3a therein (FIGURES 6 and 7) and provided with spaced-apart rim notches 5, typically located on approximately the top 180-degree curved span of the housing rim 3, as further illustrated in FIGURES 6 and 7. A rear plate 4 closes the housing opening 3a on the back side of the housing rim 3 and the rear plate 4 is further

characterized by a rear plate slot 4b (FIGURE 7). In the embodiment illustrated in FIGURE 6 a front plate 10 is typically glued or otherwise fixed to a middle plate 6 and a backing plate 6b is attached to the front plate 10, the middle plate 6 and the rear plate 4 and is rotatably disposed in the housing opening 3a of the lock housing 2. The middle plate 6 has a middle plate profile slot 6a which aligns with a corresponding backing plate slot 16b in the backing plate 6b and both slots communicate with the round housing opening 3a in the lock housing 2 and the rear plate slot 4b. The middle plate 6 further includes a retainer block slot 16a, fitted with a pair of adjacent spring slots 21a and slotted plate openings 19, for receiving corresponding retainer block springs 21 and slotted plates 18, respectively, as further illustrated in FIGURES 4-6. Each of the slotted plates 18 is further provided with a linear slotted plate slot 20, for purposes which will be hereinafter described. Further included in the middle plate 6 is a notch leg articulation slot 7 that extends through the outer circumference of the middle plate 6 and may be slightly curved to accommodate a notch retainer 22, having a rearwardly-extending notch leg 23 on one end and a forwardly-projecting gripping leg 24 on the other end, for purposes which will be hereinafter further described. Furthermore, a retainer spring 26 is seated in a retainer spring slot 26b that joins the notch leg articulation slot 7 and has one end in engagement with the projecting gripping leg 24 of the notch retainer 22 and the opposite end of the retainer spring 26 is fixed to a post or pin on the middle plate 6, by means of a spring pin 26a (FIGURES 4 and 5). A keeper 15 is seated in a keeper slot 25 in the backing plate 6b, which keeper slot 25 extends transverse to the notch leg articulation slot 7 which receives the notch retainer 22, as further illustrated in the middle plate 6 in FIGURE 6. The keeper 15 includes a keeper finger 15a that extends forwardly through a keeper leg slot 25a in the front plate 10 and a keeper leg 15b, which selectively projects into the keeper slot 25 in the backing plate 6b and has a leg notch 15c that

selectively engages the gripping leg 24 of the notch retainer 22, for purposes which will be hereinafter further described. A keeper spring 15d is also seated in the keeper slot 25 in the backing plate 6b and serves to bias the keeper 15 normally into contact with the gripping leg 24 of the notch retainer 22.

As further illustrated in FIGURES 6 and 7 of the drawings a retainer block 16 is seated in the retainer block slot 16a, provided in the middle plate profile slot 6a of the middle plate 6 and in the aligned middle profile slot 6a and backing plate slot 16b in the middle plate 6 and backing plate 6b (FIGURE 6). The spaced-apart slotted plates 18 extend from the retainer block 16 and register with the corresponding longer slotted plate openings 19. Furthermore, as illustrated in the FIGURE 6, the retainer block 16 is shaped to extend through the backing plate slot 16b, into the rear plate slot 4b and is biased by the two retainer block springs 21, seated in the corresponding spring slots 21a in the retainer block slots 16a, to facilitate normal extension of the retainer block 16 into the middle plate profile slot 6a and the backing plate slot 16b, under spring tension. As further illustrated in FIGURE 6 the retainer block 16 extends into the middle plate profile slot 6a and the rear plate slot 4b and is similarly biased by the retainer block springs 21. Moreover, a spring pin 17 extends forwardly from fixed attachment to the retainer block 16, through the spring pin access slot 14 in the front plate 10, and is designed to facilitate selective retraction of the retainer block 16 by finger or thumb pressure into the retainer block slot 16a against the tension in the retainer block springs 21, as hereinafter described.

Referring again to FIGURES 6 and 7, in a preferred embodiment the front plate 10 is glued to the middle plate 6, which closes the front of the lock housing 2 over the backing plate 6b (FIGURE 6) and the front plate 10 is fitted with a front plate dead bolt slot 11 that corresponds to and registers with the middle plate profile slot 6a in the middle plate 6, as well as

the backing plate slot 16b in the backing plate 6b and the rear plate slot 4b in the rear plate 4.

The front plate 10 is further characterized by bolt access openings 13 for receiving corresponding bolts 8 that extend through the bolt access openings 13 and through corresponding middle plate bolt openings 8b in the middle plate 6, as well as through aligned backing plate bolt openings 8d in the backing plate 6b (FIGURE 6). The bolts 8 seat in corresponding bolt retainers 8c, seated in the rear plate openings 8a, located in the rear plate 4. The bolts 8 thus removably and rotatably secure the front plate 10, the rear plate 4, the middle plate 6 and the backing plate 6b to each other on the lock housing 2, with the backing plate 6b recessed in the housing opening 3a, since both the front plate 10, the middle plate 6 (typically glued or otherwise fixed to the front plate 10) and the rear plate 4 are larger in diameter than the backing plate 6b, and rest against the front and rear surfaces, respectively, of the housing rim 3. This attachment facilitates adjustment of the tension in the bolts 8 and corresponding rotation of the front plate 10, middle plate 6 and backing plate 6b (FIGURE 6), as well as the rear plate 4 in concert and in alignment with respect to the lock housing 2. The gripping leg access slot 12 in the front plate 10 accommodates the projecting gripping leg 24, which is attached or formed integrally on one end of the corresponding notch retainer 22, as illustrated in FIGURES 1-3 and 6. The keeper slot 25a is typically provided in the front plate 10 adjacent to the gripping leg access slot 12. Furthermore, the spring pin access slot 14 is located in the front plate 10 on the opposite side of the front plate dead bolt slot 11 from the gripping leg access slot 12, to receive the spring pin 17, attached to the retainer block 16, for manipulating the retainer block 16 into recessed configuration in the retainer block slot 16a in the middle plate profile slot 6a, against the bias of the retainer block springs 21, as hereinafter further described.

As further illustrated in FIGURES 4-6 of the drawings it will be appreciated that

extension of the retainer block 16 from the retainer block slot 16a into the middle plate profile slot 6a and the backing plate slot 16b under the bias of the two retainer block springs 21, is limited by the provision of the pair of bolt legs 18a, projecting through the corresponding slotted plate slots 20 in the respective slotted plates 18 (FIGURES 4-6). The slotted plates 18 are therefore slidably seated for limited movement in the longer slotted plate openings 19, respectively. Accordingly, the retainer block 16 is normally maintained substantially in the position illustrated in FIGURE 4, extended into the aligned front plate dead bolt slot 11, middle plate profile slot 6a, backing plate slot 16b (FIGURE 6) and rear plate slot 4b when the adjustable dead bolt lock 1 is not in use, by the bias of the retainer block springs 21 and engagement of the extending distal ends of the slotted plate openings 19 in the slotted plates 18 with the corresponding bolt legs 18a, for purposes which will be hereinafter further described. Moreover, in a preferred embodiment of the invention a gripper strip 31 is glued or otherwise attached to the face of the retainer block 16 extending into the middle plate profile slot 6a (FIGURE 6) and also into the backing plate slot 16b (FIGURE 6) for enhanced frictional engagement with a deadbolt 30, as illustrated in FIGURE 5. In another preferred embodiment a rear plate tab 4a (FIGURE 2) is extended from the rear plate 4 into the middle plate profile slot 6a and backing plate slot 16b (FIGURE 6) for engaging the opposite side of the dead bolt 30 in a tight frictional fit.

Referring again to FIGURES 1 and 2 of the drawings the lock housing 2 of the adjustable dead bolt lock 1 is inserted on a dead bolt 30 mounted on the dead bolt housing 30a of a door 28 (FIGURE 2) which lies adjacent to a door frame 27. When the adjustable dead bolt lock 1 is in functional configuration on the dead bolt 30 as illustrated in FIGURE 1, the downwardly-extending housing legs 9 engage the inside surfaces of opposite sides of the connecting element

of the door knob 29, located beneath the dead bolt 30 on the door 28, and stabilize the adjustable dead bolt lock 1 on the dead bolt 30. Additional security is provided by the spring-biased engagement of the gripper strip 31 on retainer block 16 and the dead bolt 30 and seating of the rear plate tab 4a against the opposite side of the dead bolt 30. Accordingly, when the adjustable dead bolt lock 1 is so installed on the dead bolt 30 and the door knob 29 as illustrated in FIGURE 1, jarring, kicking or pushing the door 28 will not cause the adjustable dead bolt lock 1 to disengage the dead bolt 30 and the door knob 29, due to the spring-loaded retainer block 16 action and the close proximity of the downwardly-extending housing legs 9 and the inside surfaces of the door knob 29. Seating of the adjustable dead bolt lock 1 on the dead bolt 30 is quickly and easily effected as illustrated in FIGURES 2 and 6, by initially retracting the retainer block 16 from the front plate dead bolt slot 11 and the registering middle plate profile slot 6a by finger or thumb pressure applied to the spring pin 17, sliding the housing legs 9 behind and on each side of the projecting door knob 29 and then positioning the aligned front plate dead bolt slot 11, middle plate profile slot 6a, backing plate slot 16b and rear plate slot 4b on the dead bolt 30, to the position illustrated in FIGURE 1.

Referring again to FIGURES 3-6 of the drawings, under circumstances where the dead bolt 30 is positioned at an angle with respect to the perpendicular as indicated, the front plate 10, middle plate 6, backing plate 6b and the rear plate 4 (FIGURE 6) of the adjustable dead bolt lock 1 can be rotatably adjusted in concert on the lock housing 2 to orient the matching front plate dead bolt slot 11, middle plate profile slot 6a, backing plate slot 16b and the rear plate slot 4b into the same angular orientation as the dead bolt 30. This adjustment is facilitated by first moving the gripping leg 24 of the notch retainer 22 upwardly by finger pressure in the gripping leg access slot 12, against the bias in the retainer spring 26. This action slides the notch retainer

22 in the notch leg articulation slot 7 (FIGURE 4) and displaces the rearwardly-extending notch leg 23 from the rim notch 5 in which it was seated by spring tension, to the position illustrated in FIGURE 4. Extension of the notch leg 23 from the rim notch 5 against the bias of the retainer spring 26 is maintained by corresponding projection of the leg notch 15c of the keeper 15 into the notch 7 and into contact with the gripping leg 24 of the notch retainer 22, by action of the bias in the keeper spring 15d (FIGURE 4). This action also allows free rotation of the front plate 10 and the middle plate 6 as a composite illustrated in FIGURE 6, with the backing plate 6b illustrated in FIGURE 6 and with the rear plate 4 (including the keeper 15 and the notch retainer 22) in concert with respect to the rim teeth 4 and the rim notches 5 of the fixed lock housing 2. This rotation is effective to match the angular orientation of the registering front plate dead bolt slot 11, middle plate profile slot 6a, backing plate slot 16b (FIGURE 6) and rear plate slot 4b, with the dead bolt 30. When this accommodation position is reached by rotation of the front plate 10, the middle plate 6, the backing plate 6b and the rear plate 4 together, the keeper finger 15a of the keeper 15 is forced away from the gripping leg 24 against the bias of the keeper spring 15d by finger or thumb pressure to disengage the keeper leg 15b from the gripping leg 24 of the notch retainer 22. Accordingly, this pressure released from the gripping leg 24 facilitates return of the notch leg 23 into a corresponding underlying and matching rim notch 5 in the housing rim 3 by operation of the retainer spring 26, as illustrated in FIGURE 5. The adjustable dead bolt lock 1 can then be easily inserted on the dead bolt 30 by initially slipping the housing legs 9 against the opposite inside surfaces of the door knob 29, applying finger or thumb pressure to the spring pin 17 extending from the spring pin access slot 14 in the front plate 10 to retract the retainer block 16 into the corresponding retainer block slot 16a against the tension of the retainer block springs 21, slipping the matching front plate dead bolt slot 11, middle plate profile slot 6a,

backing plate slot 16b and rear plate slot 4b over the dead bolt 30 and releasing finger or thumb pressure from the spring pin 17, to facilitate pressure applied by the retainer block 16 against the dead bolt 30 by operation of the retainer block springs 21. In this manner, a dead bolt 30 of substantially any width not greater than the composite width of the front plate dead bolt slot 11, the registering middle plate profile slot 6a and backing plate slot 16b, as well as the rear plate slot 4b, can be stabilized by the adjustable dead bolt lock 1 of this invention.

Referring now to FIGURE 8 of the drawings in another preferred embodiment of the invention a non-adjustable X-slot dead bolt lock 32 is illustrated, with no adjustment features in the X-slot housing 33. An X-slot 34, shaped by X-slot openings 35, is provided in the X-slot housing 33 to accommodate the dead bolt 30, illustrated in phantom. As in the case of the dead bolt lock 1 illustrated in FIGURES 1-7 of the drawings, a pair of housing legs 9 extend downwardly in parallel relationship with respect to each other from the X-slot housing 33 for seating on the inside surfaces of a door knob 29, also illustrated in phantom, when the X-slot dead bolt lock 32 is in the functional configuration illustrated in FIGURE 8. It will be appreciated from a consideration of the X-slot dead bolt lock 32 that the X-slot 34 facilitates accommodation of dead bolt 30 in two angular configurations without the necessity of adjustment, as is the case in the embodiment illustrated in FIGURES 1-7 of the drawings.

Similarly, referring to FIGURE 9 of the drawings a non-adjustable cross-slot dead bolt lock 37 is illustrated, having a cross-slot housing 38, fitted with a cross-slot 39 having cross-slot openings 40 that are vertically and horizontally-oriented, as indicated. A dead bolt 30, illustrated in phantom, is shown in vertical orientation, captured by the vertical ones of the cross-slot openings 40. The dead bolt 30 is prevented from rotating out of the locked configuration by the position of the cross-slot dead bolt lock 37, with the downwardly-extending legs 9 seated behind

and on each side of the door knob 29, also illustrated in phantom.

FIGURES 10-12 illustrate an alternative embodiment of the cross-slot dead bolt lock 37 illustrated in FIGURE 9, wherein a retainer plate 50, having a retainer plate body 51 and retainer plate legs 53 is slidably mounted on the rear surface of the cross-slot housing 38 by means of a pair of retainer plate screws 54. A retainer plate flange 52 typically projects from the top of the retainer plate body 51 for gripping purposes. Accordingly, the retainer plate 50 is adjusted upwardly in the direction of the arrows on the cross-slot housing 38 as the cross-slot dead bolt lock 37 is positioned on the dead bolt 30 and door knob 29 (both illustrated in phantom) as shown in FIGURES 10 and 11, and is adjusted downwardly in the direction of the arrow to seat against the rear surface of the dead bolt 30 and further stabilize the cross-slot dead bolt lock 37 on the dead bolt 30, as illustrated in FIGURE 12.

FIGURES 13 and 14 illustrate other non-adjustable, or fixed configurations of the dead bolt lock of this invention, with the vertical access dead bolt lock 42 illustrated in FIGURE 13 having a vertical access housing 43, provided with a vertical access slot 44 for receiving a vertically-oriented, locked dead bolt 30 (illustrated in phantom). A retainer plate 50 may be installed on the vertical access dead bolt lock 42, in the manner illustrated in FIGURES 10-12 relative to the cross-slot dead bolt lock 37. As illustrated in FIGURE 14 the horizontal access dead bolt lock 46 has a horizontal access housing 47, fitted with a horizontal access slot 48 for receiving a dead lock 30 (illustrated in phantom) in the horizontal locked configuration.

It will be appreciated from a consideration of the fixed X-slot dead bolt lock 32, cross-slot dead bolt lock 37 (in all of its variations), the vertical access dead bolt lock 42 and the horizontal access dead bolt lock 46 illustrated in FIGURES 8-14, that under circumstances where securing of a single dead bolt lock of known locked angular orientation is desired, such as in the

home or when traveling to a place having dead bolt locks of such known angular orientation, the fixed dead bolt locks described above can be used to accommodate and secure these dead bolts. Furthermore, under circumstances where the various dead bolt locks are to be supplied to a hotel, motel or condominium facility having multiple dead bolts designed with a common dead bolt locking configuration, a dead bolt lock having a single slot, either vertically-oriented or horizontally-oriented, or the X-slot or cross-slot configurations, can be utilized to effect the desired securing of the dead bolt, as further illustrated in FIGURES 8-14 of the drawings. Moreover, in the case of the cross-slot dead bolt lock 37 illustrated in FIGURES 10-12, the sliding retainer plate 50 serves to add security by engaging the rear surface of the dead bolt 30 when the dead bolt lock is in functional configuration on the dead bolt 30.

It will be further appreciated by those skilled in the art that the dead bolt lock of this invention, in all of the embodiments described above, is designed to accommodate substantially any dead bolt on substantially any door, including motel doors, hotel doors, homes, condominiums and the like, under circumstances where a door knob is located beneath the dead bolt, as is the case in most conventional door installations. In the simplified, fixed or non-adjustable designs, the lock housing 2 can be solid, with a slot or slots provided at the existing lock angle of a dead bolt 30 (FIGURES 8, 9, 13 and 14) without the provision of a front plate 10, middle plate 6, backing plate 6b or rear plate 4 and corresponding internal locking components, including the retainer block 16. Accordingly, as described above, the fixed dead bolt locks of this invention can thus be customized for a single dead bolt 30 lock angle, or for multiple dead bolts 30, as in a motel, hotel, home, condominium or the like. Moreover, the sliding retainer plate 50 can be added to the vertical access dead bolt lock (FIGURE 13), as illustrated with respect to the cross-slot dead bolt lock 38 illustrated in FIGURES 10-12, to provide added

security.

In the embodiment of the adjustable dead bolt lock 1, referring again to the drawings, the front plate dead bolt slot 11 and corresponding middle plate profile slot 6a and backing plate slot 16b, where applicable, as well as the rear plate slot 4b, can be of sufficient size to accommodate a dead bolt 30 of substantially any width and length, since the retainer block 16 is designed to extend into the aligned front plate dead bolt slot 11, middle plate profile slot 6a and aligned backing plate slot 16b, as well as the rear plate slot 4b, to compensate for dead bolts that are small and/or relatively narrow, such as the dead bolt 30 illustrated in the drawings. Furthermore, the position of the downwardly-extending housing legs 9 inside and on each side of the door knob 29 in all of the embodiments, insures that shaking or kicking of the door 28 from the outside will not dislodge the adjustable dead bolt lock 1 (or the fixed dead bolt locks described above) from the protective position on the dead bolt 30. Yet, the dead bolt locks of this invention, in all of the above described embodiments, are quickly, easily and efficiently removed from the door knob 29 and the dead bolt 30, should such removal be required in case of fire or other emergency, by simply pulling the lock housing outwardly (after first sliding the retainer plate 50 upwardly, if the dead bolt lock is so equipped) to clear the dead bolt 30 from the aligned slots and then lifting the dead bolt lock upwardly to remove the housing legs 9 from the door knob 29, and quickly and easily access both the door knob 29 and the dead bolt 30, as necessary.

It will be further appreciated that as heretofore described, in the embodiment illustrated in FIGURE 6, the front plate 10 and middle plate 6 are glued or otherwise fixed together to facilitate precise alignment of the front plate dead bolt slot 11 and the middle plate profile slot 6a together, with the backing plate slot 16b and the rear plate slot 4b. The plates are preferably

assembled in this manner to facilitate insertion of the respective retainer block 16, retainer block springs 21, notch retainer 22, retainer spring 26, keeper 15 and keeper spring 15d in the corresponding slots and notches provided in the front plate 10, middle plate 6 and backing plate 6b, as described above and as illustrated in FIGURE 6. Alternatively, the front plate 10 and middle plate 6 can be molded or shaped together as a composite, with a plug or alternative access element (not illustrated) removed and reinserted for the same purpose, or by other techniques known by those skilled in the art. Furthermore, the various components of the respective dead bolt locks of this invention can be fabricated from a variety of materials, including metal, plastic, fiberglass and the like, in non-exclusive particular. For example, referring again to the drawings, the lock housing 2, X-slot housing 33, cross-slot housing 38, vertical access housing 43 and horizontal access housing 47 illustrated in the drawings can be injection-molded from suitable plastic materials, along with other elements of the devices, according to the knowledge of those skilled in the art. Moreover, although the lock housings in the embodiments illustrated in FIGURES 1-14 of the drawings are round, it will be appreciated that the lock housings can be otherwise shaped, typically in the configuration of an octagon or other polygon, as desired.

While the preferred embodiments of the invention have been described above, it will be recognized and understood that various modifications may be made in the invention and the appended claims are intended to cover all such modifications which may fall within the spirit and scope of the invention.

Having described the invention with the particularity set forth above, what is claimed is: